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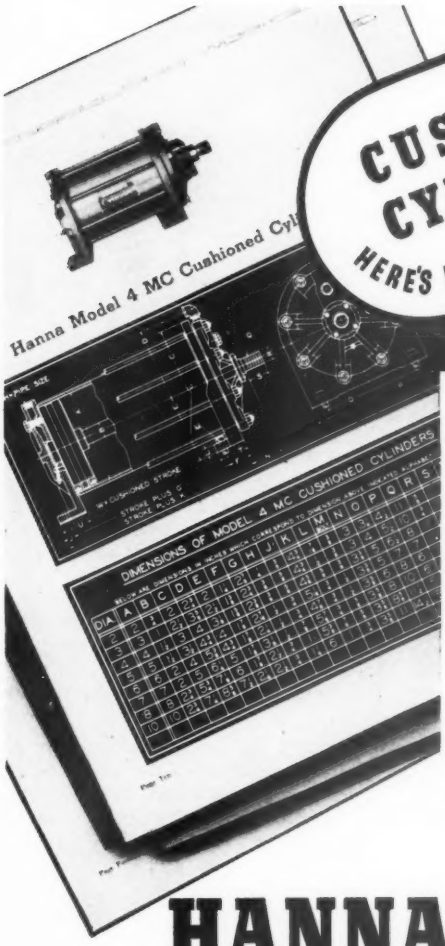

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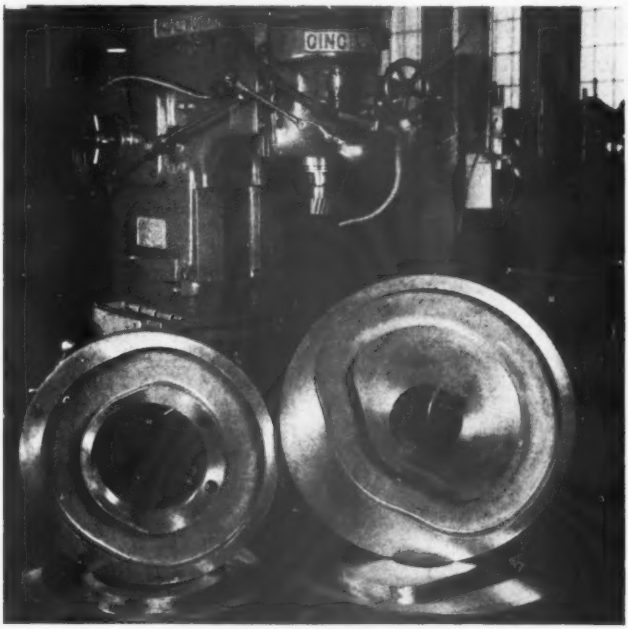

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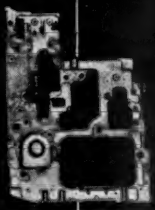

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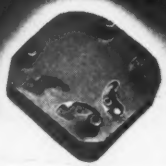

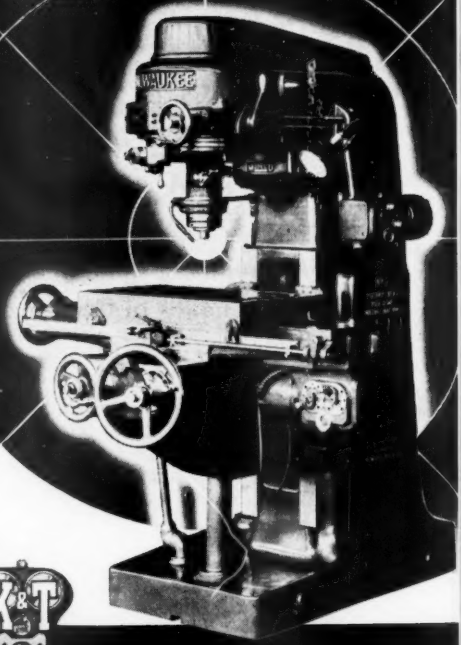

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February, 1940 Vol. 5, No. 11

DIE DESIGNING AND ESTIMATING

By CHARLES BOHMER
and
GEORGE DANNES

Article I of a New Series

HEREWITH begins the 1940 Series of articles on Die Designing and Estimating. This time the joint work of Charles Bohmer and George Dannes, authors respectively of the 1938 and 1939 series, popular demand for which made it mandatory upon us to publish them in book form. In the latter volumes are to be found the detailed description of the unique Dannes method and the tables and charts for predetermining the time values which are used in this article and will continue to be in those which follow during the year. It is evident from the widespread interest that these articles and books are fulfilling a real need.

—The Editor

Design and Estimate of a Notch, Pierce, Cut-Off and Form Die

Analyses of Design and Application of Method for Estimating Time Required to Machine and Assemble Parts

Design

The Part

THE part which this die is to fabricate is a cover plate which must fit perfectly between two uprights, therefore it is necessary to accurately maintain the width of 1.702 inches. The two holes used for mounting must be held within ± .005 inch of their specified locations. All other dimensions may vary ± .015 inch.

Type of Die

The generous tolerances allowed in the dimensions of the part permitted the selection of a Notch, Pierce, Cut-off and Form Die which operates as economically as is possible because it makes a complete part with each stroke and uses a minimum amount of stock. The material is tinplate .015 inch thick, sheared to the specified width—the length of the finished part.

Operation of Die

Briefly stated, the die operates as follows: The first strip of stock (and each new one thereafter) is started slightly ahead of the cut-off station so that its end will be in true relation with the notchings and piercings. After the first

stroke of the press the strip is fed forward until stopped by the gage pin slightly ahead—about .007 inch—of its proper location. With the second stroke the pilots enter and locate the part perfectly before the cut-off and forming operations. Thereafter, one complete part is made with each stroke of the press until the entire length of strip stock has been used.

Die Part Details

Detail 10. The pierce, notch and cut-off die block is made of tool steel, hardened after machining to size and shape specified in part drawing and form development.

Caution: Use great care to locate the cut-off edge accurately with reference to the notchings to insure a perfect edge on the part. If the die layout is incorrect in this respect and the cut-off takes place back of the notches, a thin sliver of material results across the openings.

If the reverse occurs, the remaining edge will have notches of a depth equivalent to the error. In general practice it is well to favor the layout so that the cut-off takes place slightly in front of the notches—about .003 inch—to insure the blank having a "clean" edge.

Details 2, 3, 4, 5, 6, 7, 8, 21 comprise the cut-off and form unit for the second, final step. Construction is the double pad type in which the cut-off punch serves not only to cut off but also to form the part. The lower pad acts as a form *die* and the upper as a form *punch* with the end block as its die. Pad pressures should be sufficient to insure forming at both ends simultaneously to eliminate possibility of blank slippage. With the exception of the pilot retaining pad (Detail 5), all parts of the unit should be made of tool steel and hardened.

It is necessary that pad locations be controlled which is done with shoulder screws accurately fitted to prevent side looseness and to establish the normal position of each pad in relation to the die and punch.

With forms of this type, precaution must be taken against the blank tipping and the sides being mis-formed on the up stroke. This is accomplished by using spring pins (Detail 6).

Caution: Because the pilots definitely locate the blank they must precede in operations all other die parts, therefore the length and pressure of the spring pins must be such as to permit the pilots to function freely and accurately.

Guards (Detail 6) are necessary to protect the *lower* pad and they should be made high enough to completely enclose the opening when the pad is up and their shape should permit uninterrupted ejection of parts. Clearance holes in the die shoe must be provided for both pilots and cut-off punch to eliminate scrap freely, thus avoiding possibility of a "jam". The approximate stop (Detail 21) is a plain, solid pin properly located and driven into the end form block.

If properly constructed, this unit will operate in this manner: The strip stock is fed forward until it is stopped by the pin (21), the punch descends, the pilots (7) locate the part, the cutting-off operation severs the blank but it is still confined between the upper and lower pads. As the punch continues its downward stroke, one end of the part is formed over the lower pad by the cut-off punch and the other over the upper pad by the end block. As the punch and die separate, the pads return to their normal positions and the finished part is left on the lower pad to be ejected.

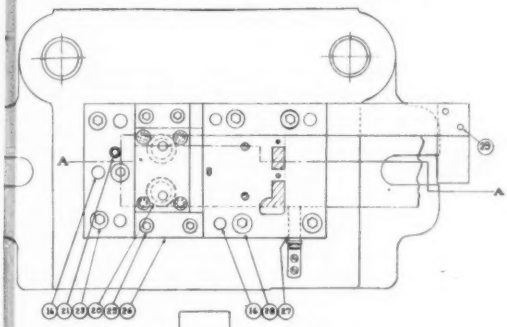
Details 11, 17, 18, 27 include stripper, back gage, stock rest, and spring-actuated front gage or pusher. All parts in the unit excepting the pusher are made of cold rolled steel. Unit is mounted permanently and located in relation to the die. The stripper length and width are the same as those of the die; the thickness is determined by necessity. All openings in the stripper must correspond to those in the die and be large enough to permit punches to pass through freely and without interference.

The back gage is a straight bar extending beyond the end of the die to provide suitable guidance for the stock. It must be permanently fastened in relation to die openings and on a line exactly parallel with the perforators and pilots. To obtain the clearance necessary for the stock to pass between stripper and die, and front and back gages, a double step is machined in the stripper, the first step for the back gage and the second for the stock clearance. The clearance between the die and stripper should be sufficient to provide a clean passage for the stock, and between the gages it

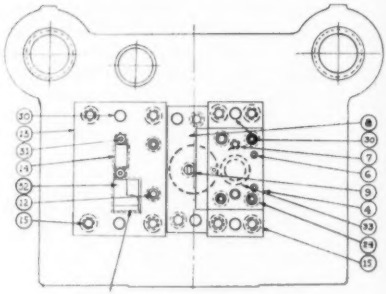
should be about $\frac{1}{16}$ inch more than the width of the stock.

against the back gage, thus eliminating any tendency for it to be inaccurately

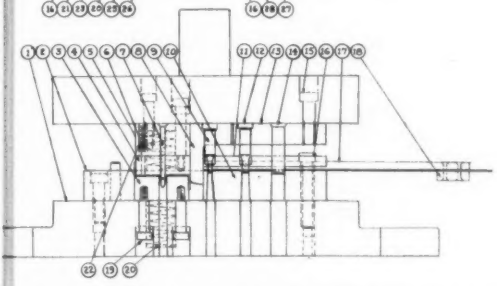
Plan View of Die Assembly



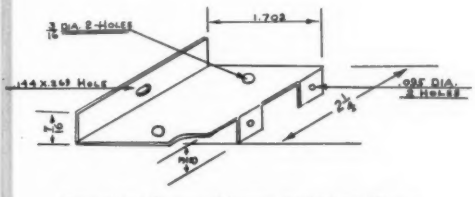
Plan View of Punch Assembly—Inverted



Note: Provide Heel on Punch



Section on Line A-A of Die and Punch Assembly



Detail of Formed Part .015″ Tin Plate

MATERIAL LIST

Det.	Req.	SIZE & MATERIAL	Remarks
1	1	6″ x 10″ DIE SET	Purch.
2	1	1″ x 1¾″ x 4¼″ TS	Hdn. & Gr.
3	1	¾″ x 1¾″ x 2¾″ TS	" "
4	1	¾″ x 1¾″ x 2¾″ TS	" "
5	1	1″ x 1¾″ x 4¼″ CRS	
6	3	SPRING PINS	
7	2	⅝″ x 2½″ DR. ROD	Hdn.
8	1	1½″ x 2″ x 4″ TS	Hdn. & Gr.
9	1	½″ Dia. x 2″ DR. ROD	" "
10	1	1″ x 4″ x 4½″ TS	" "
11	1	½″ x 4″ x 4½″ CRS	
12	2	½″ Dia. x 2″ DR. ROD	Hdn. & Gr.
13	1	⅝″ x 3″ x 4½″ CRS	" "
14	1	½″ x ¾″ x 1¾″ TS	" "
15	10	⅜″–16 x 1¼″ Soc. Sc.	Stock
16	6	⅜″ Dia. x 2½″ LG. DOWELS	Stock
17	1	⅛″ x 1″ x 8½″ CRS	Pk. Hdn.
18	1	1/16″ x 1″ x 2½″ CRS	Cyan.
19	4	STRIPPER BOLTS	Stock
20	2	SPRINGS	"
21	1	⅜″ x 1¼″ DOWEL	"
22	1	SPRING TO SUIT	"
23	3	⅜″–16 x 1¼″ Soc. Sc.	"
24	4	STRIPPER BOLTS	"
25	4	¼″–18 x 1¼″ Soc. Sc.	"
26	2	¾″ x 1″ x 2¼″ CRS	Pk. Hdn. & Gr.
27	1	STOCK PUSHER	
28	4	⅜″–16 x 2″ Soc. Sc.	Stock
29	2	⅛″ x ⅝″ RIVETS	"
30	6	⅜″ Dia. x 1½″ DOWELS	"
31	2	½″ Dia. x 2″ DR. ROD	Hdn. & Gr.
32	1	1″ x 1″ x 1¾″ TS	" "
33	1	SPRING	Stock

Fig. 40, Notch, Pierce, Cut-Off and Form Die Designed by E. Taylor

The front spring pusher gage is located in a recess machined to permit it free movement. It consists of a spring and a shouldered flat piece of hardened steel long enough to extend into the stripper clearance slot and hold the stock located. The stock rest is screwed or riveted to the extreme end of the back gage perpendicularly to the edge.

Details 9, 12, 13, 14, 31. These are punch pad, perforators and punches. The punch pad is made of cold rolled

steel, with punch openings accurately located and machined. Punch openings are square and rectangular, perforator openings round. Both punches and perforators are made of tool steel, hardened and fitted securely in the pad. Perforators are the headed type, ground to assure greater accuracy in line-up. Punches are the peened head type with bodies made to suit the pad and with working "fronts" fitted to die openings. Because of the thinness of the cut-off punch, the base type of construction is used, which gives the punch additional strength. It is mounted in the base whereas all other punches and perforators are mounted in the pad.

Detail 1 is a standard die set of specified dimensions; to assure greater accuracy in line-up it should have long leader pin bushings.

Screws and Dowels required for mounting parts, as well as the directions in which screw heads and threads should "lie" are carefully indicated on drawing.

Estimate

Estimating the time required for making the parts and assembling them into the complete die proceeds as heretofore. Use the standard Die Work Estimating Form as shown in Fig. 41.

MACHINING AND GRINDING

Column A—for time values see Table, Fig. 6.

	Machining hr.	Grinding hr.
DIE BLOCK—Det. 10—1" x 4" x 4½" TS	.7	.9
PUNCH—Det. 32—1" x 1" x 1¾" TS	.3	.5
Punch—Dets. 14 and 9—Omitted because of small size.		
LOWER PAD—Det. 3—¾" x 1¾" x 2¾" TS	.5	.7
UPPER PAD—Det. 4—¾" x 1¾" x 2¾" TS	.5	.7
UPPER PAD, BACK UP AND PILOT RETAINER—Det. 5—1" x 1¾" x 4¼" CRS (Machining — 70% of Table Values) (Grinding—50% + .1 hr. for set-up)	.4	.3
FORM DIE BLOCK—Det. 2—1" x 1¾" x 4¼" TS	.5	.7
CUT-OFF AND FORM PUNCH—Det. 8—1½" x 2" x 4" TS	.5	.7
PUNCH PAD—Det. 13—⅝" x 3" x 4¼" CRS (Machining — 70% of Table Values) (Grinding—50% + .1 hr. for set-up)	.4	.3
STRIPPER—Det. 11—½" x 4" x 4½" CRS (Same as above)	.4	.3
PAD GUIDE—Det. 26—2 required. ¾" x 1" x 2¼" CRS (Machining — 70% of Table Values)	.4	.3

MACHINING OF BACK GAGE AND STOCK REST—Dets. 17 and 18—made of CRS is negligible. Use minimum table values—

	Machining Hr.
Back Gage	.2
Stock Rest	.2
TOTAL Column "A"	10.4 hrs.

DRILLING ALL HOLES EXCEPT FOR PERFORATORS AND PILOTS

Column B—for time values see Table, Fig. 7

DIE BLOCK—Det. 10—4 screws, 3 dowels	.8 hr.
LOWER PAD—Det. 3—4 tapped holes	.5
UPPER PAD—Det. 4—4 tapped holes	.5
PAD BACK-UP—Det. 5—4 clearance holes for stripper bolts, 4 mounting screws and 2 dowels	1.1
FORM DIE BLOCK—Det. 2—3 screws, 3 dowels	.7
FORM PUNCH—Det. 8—2 screws, 2 dowels	.5
PUNCH PAD—Det. 13—4 screws, 2 dowels	.7
STRIPPER—Det. 11—4 screws, 3 dowels	.8 hr.
2 PAD GUIDES—Det. 26—2 screws each	.6
PUNCH HOLDER—4 screws and 2 dowels to mount pad back-up, 4 clearance holes for stripper bolts which actuate	

upper pad, 2 screw and 2 dowel holes for mounting cut-off and form punch, 4 screws and 2 dowels for mounting punch pad. Total 20 holes 2.1

DIE SHOE—4 screw and 3 dowel holes to mount die block, 4 screw holes for mounting 2 pad guides, 4 clearance holes for stripper bolts which actuate lower pad, 3 screw and 3 dowel holes for mounting forming die block. Total 21 holes 2.2

BACK GAGE—Det. 17—2 screw and 2 dowel holes for mounting between stripper and die, and 2 holes for riveting stock rest 7

STOCK REST—Det. 18—Also has 2 rivet holes 3

SPRING HOLES IN UPPER AND LOWER PADS — (see Fig. 8) 3 @ .5 hr. each 1.5

TOTAL Column B ..... 13.0 hrs.

DIE WORK ESTIMATING SHEET

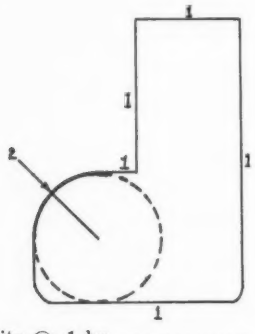
		A	B	C	D	E	F
DET. 10	DIE BLOCK	.7.9	.8				2.5
	OPEN A			.7	6.6		
	OPEN B			.4	4.4		
	OPEN C			.4	3.4		
Det. 32	PUNCH A	.3.5			4.2		1.0
Det. 14	PUNCH B				2.8		1.0
Det. 9	PUNCH C				2.9		1.0
Det. 3	LOWER PAD	.5.7	.5			.3	.5
Det. 4	UPPER PAD	.5.7	.5			.8	.5
Det. 5	PAD BACK-UP	.4.3	1.1			.8	.5
Det. 2	FORM DIE	.5.7	.7		.8		.5
Det. 8	FORM PUNCH	.5.7	.5		6.0 .8		1.0
Det. 13	PUNCH PAD	.4.3	.7		1.2 1.2		2.0
Det. 11	STRIPPER	.4.3	.8		1.2 .8 .8 1.5		
Det. 26	PAD GUIDE	.4.3	.6				.5
Det. 12 31	PERFORATORS			.8		2.8 3.6	2.0
Det. 7	PILOTS			.4		1.0	1.0
Det. 21	STOP					1.0	
	PUNCH HOLDER		2.1				
	DIE SHOE		2.2		1.8 1.2 .2	.3	
Det. 17	Back Gage	.2	.7				
Det. 18	Stock Rest	.2	.3				
Det. 20 33	SPRINGS		1.5				
Det. 6	SPRING PINS					1.7	
	INSPECTION			3.0			
	TRYOUT						3.0
	DEVELOPMENT						5.0
		10.4	13.0	5.7	41.8	12.3	22.0

Total 105.2 hrs.

Fig. 41

LAYOUT AND INSPECTION

Column C—for contour time values see Tables, Figs. 9, 10, 11, 12. It is assumed that opening A can be made by boring the large radius in this manner:



5 units @ .1 hr.	.5
1 unit @ .2 hr.	.2
Sub-total	.7 hr.

Layout

DIE OPENING A—7 units	.7 hr.
DIE OPENING B—4 "	.4
DIE OPENING C—4 "	.4
PERFORATORS—4 @ 8 units each	.8
PILOTS 2 @ 2 units each	.4

Inspection

Tolerances being ± .005" add to layout time .5 hr. for each opening	3.0
TOTAL Column C	5.7 hrs.

MACHINING, FINISHING AND FITTING DIE PARTS

Column D—use contour units as established for Column C, also drawings and Tables, Figs. 13-20.

	Machining hr.	Finishing hr.
DIE OPENING A—units 7, size 4" (nearest value units 8, size 4")	6.0	.6
DIE OPENING B—units 4, size 2"	4.0	.4
DIE OPENING C—units 4, size 1"	3.0	.4
Sub-total	14.4 hrs.	

Note: The opening being made only ½" deep, the rest is relieved from the back of the die block with a larger hole.

PUNCH A—Det. 32—Type I—units 7, size 4"	4.2 hr.
PUNCH B—Det. 14—Type I—units 4, size 2"	2.8
PUNCH C—Det. 9—units 4, size 1" (See Drill Rod Punches, Fig. 16).	2.9
FORM DIE BLOCK—Det. 2—This block must have one edge rounded off to provide a forming radius. No time value has been set for this operation in previous chapters, but it has been established that .2 hr. for each inch of length is sufficient. This includes machining or filing and stoning. This block, being 4¼" long, would require .8 hr. for this radius.	.8
FORM PUNCH—Det. 8—Type 2—units 4, size 8"	6.0
As per design, slotting punch, Det. 9, is mounted in the pad of this punch. Note that punch has a round shoulder base; some means of holding it in position, preventing turning or moving, will have to be employed. Generally it is a pin which is used as a lock, its diameter being embedded half in the punch and half in the surrounding pad. The time consumption will be about the same as for a straight Type I punch of corresponding size and units—in this case units 4, size 1"	.8
PUNCH PAD—Det. 13—OPENINGS FOR PUNCHES A, B	
PUNCH A—units 4, size 4"	1.2
PUNCH B—units 4, size 2"	1.2
STRIPPER CLEARANCE HOLES	
PUNCH A—units 7, size 4"	1.2 hrs.
PUNCH B—units 4, size 2"	.8
PUNCH C—units 4, size 1"	.8
STRIPPER SLOT—3"x6" (see Fig. 18)	1.5
SLUG CLEARANCE HOLES IN DIE SHOE	
PUNCH A—units 7, size 4"	1.8
PUNCH B—units 4, size 2"	1.2

PUNCH C—round hole 2

TOTAL Column D .....41.8 hrs.

PERFORATORS, PILOTS AND THEIR CORRESPONDING HOLES

Column E—see Table and drawings, Figs. 21-26.

PERFORATORS—Type 2—(see Fig. 22)

2—.095" diameter @ .7 hr. each 1.4 hrs.

2—.187" diameter @ .7 hr. each 1.4

Sub-total ..... 2.8 hrs.

PERFORATOR HOLES (see Fig. 23) 4 @ .9 hr. each .... 3.6 hrs.

PILOTS—Type I—(Fig. 22) 2 @ .5 hr. each ..... 1.0 hr.

CLEARANCE HOLES—2 for pilots in lower pad @ .1 hr. each + .1 hr. for set-up 3

PILOT HOLES (see Fig. 24)—2 in upper pad @ .4 hr. each. .8

PILOT HOLES—2 in pad back-up 8

PILOT CLEARANCE HOLES—2 in die shoe 3

STOP—1 pinstop (see Fig. 25) 1.0

SPRING OR EJECTOR PIN (see Fig. 27-C) 1.7

TOTAL Column E .....12.3 hrs.

ASSEMBLY, TRYOUT, DEVELOPMENT

Column F (see Table, Fig. 28 and accompanying text)

MOUNTING DIE, STRIPPER AND BACK GAGE ..... 2.5 hrs.

Mounting 4 punches @ .1 hr. each 4.0

Mounting lower pad, upper pad, pad back-up and forming die block @ .5 hr. each 2.0

Mounting assembled punch pad 2.0

Mounting 2 pad guides 5

Mounting 4 perforators @ .5 hr. each 2.0

Mounting 2 pilots @ .5 hr. each 1.0

TRYOUT 3.0

DEVELOPMENT (2 L bends). 5.0

TOTAL Column F .....22.0 hrs.

Estimated hours of labor required .....105.2 hrs.

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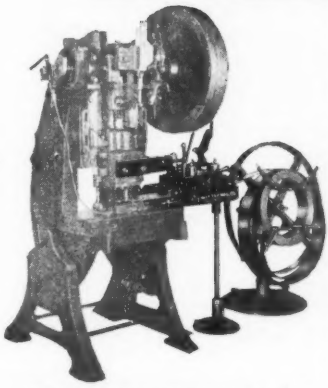

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A **Reader Requested** Article

Steel for Molds

By Edward F. Bachner
General Manager
Chicago Molded Products Corporation

THERE is such a wide variety of plastic molding materials, each having different characteristics affecting their molding technique that no hard and fast rules can be set up to govern the selection of steels for all molds. Yet, the correct choice of steel for molds is of major importance.

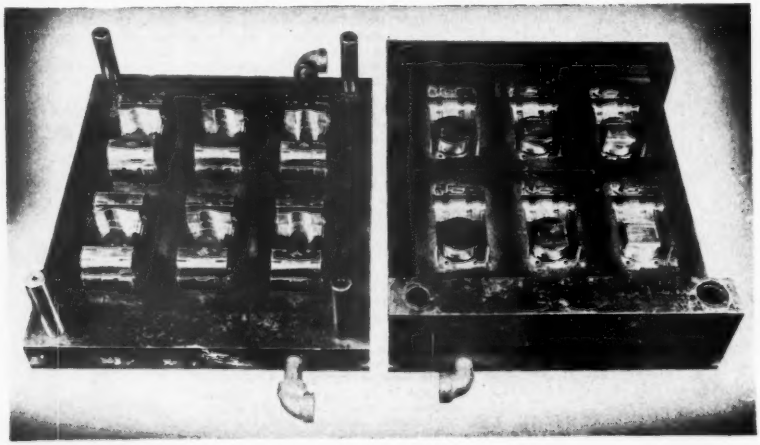
A good mold steel should have the following properties:

(1) Cleanness;
(2) Ease of fabrication in hobbing, machining and heat treating;
(3) Strength to resist deformation (upsetting, bending or breaking) in service; and
(4) Wear resistance.

Clean steel eliminates the likelihood of running into internal defects when the mold is being finished, and after considerable time and money has been expended. The highly polished finish necessary on mold surfaces cannot be obtained except by the use of clean, flawless steel. Highly polished molds insure the production of cleaner molded parts and so save time in finishing and reduce trouble in ejecting parts from the mold.

Some molds are shaped largely by hobbing, some by machining and others by a combination of both. Since an alloy steel anneals harder than one of the same carbon content without alloys, the selection of a mold steel is a compromise between final strength, wear resistance and hobbing properties.

The question of strength is vital in dies having thin sections or in large dies



A six cavity mold produced by hobbing the cavities. These were first hobbed and then machined to final finished form.

where an entire surface may sink or cave in under heat and pressure. The strength is measured largely by the yield point of the steel and since alloy mold steels can be heat treated to show more strength than plain low carbon mold steels, alloys are put into the better grades of mold steel. Wear resistance, so important in long runs, is generally improved by the addition of alloys.

There are three general classes of steel used for plastic molding—(1) steel for Master Hobs; (2) steel for Cold Hobbed Molds; and steel for molds not adaptable to the cold hobbing process, which must be machine cut.

A chrome-tungsten-vanadium steel is well suited for making the hob. A typical analysis of this steel is:

C	Cr	W	V
Carbon	Chromium	Tungsten	Vanadium
.45	1.25	2.75	.25

Such steel, if properly hardened and carefully polished, will insure a tough, hard hob that will stand up well under the heavy hobbing pressures.

Hobs of this steel after being machined to shape should be heated to 800° F. After the hob has been thoroughly heated throughout at this temperature, the hardening heat should be raised to 1600° F and the hob quenched in soluble oil and allowed to cool slowly. The hob should then be given a high polish.

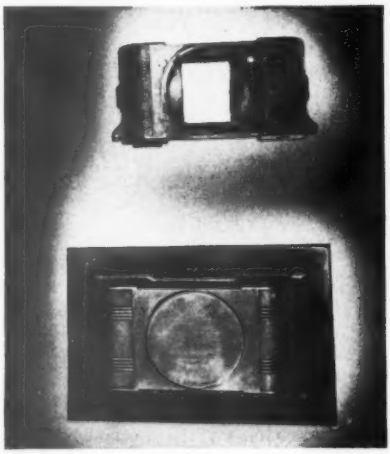
Other hobbing steels with their approximate analyses are:

C	Mn	W	Cr	Mo	Ni
.50	.40	...	.80	.75	1.50
.90	1.10	.50	.50	...	....
1.50	....	...	12.00	.75	....

It should be understood that no single steel is "best suited" for hobs. Everything from high carbon high chrome (air hardening type) to the tough steels listed have been used successfully.

There are several types of steels well suited for cold hobbed molds. One is a low carbon type steel, dead soft annealed to a Brinell hardness of 100 maximum, preferred by many because of its ease of flow under pressure.

High core hardness is not obtainable with this type of steel but satisfactory, wear-resisting surface hardness can be given it by carburizing.



A chrome tungsten vanadium tool steel hob and the plastic molded part.

A typical anlysis would show as follows:

C	Mn	P	S
.04–.05	.15–.20	Low	Low

After the cold hobbing operation, molds made from this steel should be given the standard carburizing cycle of 1650° F long enough to obtain the desired case depth; quenched in oil and then tempered at 350° F to relieve the hardening strains.

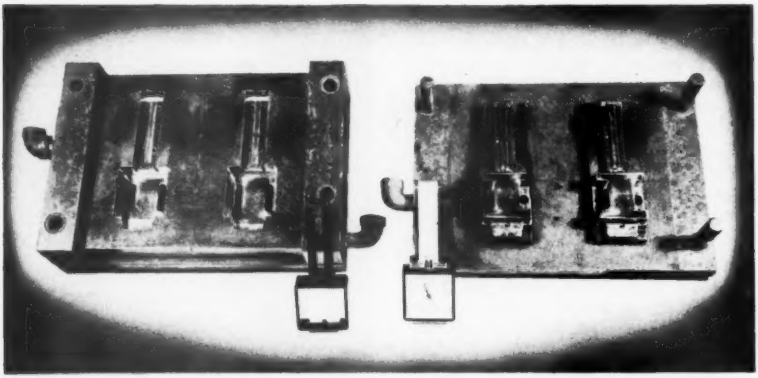
If a steel of greater toughness and resistance to upsetting is required, then an alloy type of cold hobbing mold steel should be selected from the following analyses:

	C	Mn	Ni	Cr
S.A.E. 3115	.10–.20	.30–.60	1.00–1.50	.45–.75
S.A.E. 3312	.10–.20* (Max. .17)	.30–.60	3.25–3.75	1.25–1.75
S.A.E. 3110	.10	.45	1.25	.65

These alloy type steels are supplied fully annealed to hardness of from 120 to 180 Brinell.

These steels can be hardened either by the use of solid compounds, or gas, or by liquid compounds. The carburizing is done at a temperature of 1600° to 1700° F with sufficient time to secure depth of case of from $\frac{1}{32}$ inch to $\frac{3}{32}$ inch.

*Usually under .15.



These cavities and plungers were machined to shape from solid steel blocks. Both the molded part and the finished product are shown.

After carburizing, the steel should be allowed to cool slowly and then be reheated to from 1425° to 1475° F and quenched in oil to obtain maximum surface hardness and core toughness. After quenching, the mold should be tempered for several hours at from 350° to 550° F.

For the larger molds, not adaptable to the hobbing process, which have to be machined to shape, there are two types of steels generally used.

One may be chrome nickel steel similar to S.A.E. 3120 and the other may be of a S.A.E. 3312 composition. S.A.E. 3120, a medium alloy chrome carburizing grade for molds that are to be machined, readily takes care of small and medium size molds. S.A.E. 3312, because its greater core strength, will withstand more pressure.

(Editor's Note: The biggest molds in the country are being made by one large producer exclusively from S.A.E. 3312.)

Both steels are case hardening and require a fairly heavy case to insure stability of surface. The necessity of putting on a heavy case and the consequent long period of carburizing heat may develop considerable distortion, which means added expense to the final operation of polishing and fitting the plungers and cavity.

Perhaps as satisfactory a type of steel as either of the above for large molds is a cold melt electric steel of medium carbon with a combination of alloys of chrome, silicon, manganese and molybdenum. This type of steel has good machining qualities, changes shape very little in heat treatment and will take a high polish. This steel is supplied at a Brinell hardness just under 200 and though tougher to machine than the lower carbon nickel and nickel-molybdenum types, will, with proper heat treatment, develop a very hard case and high core hardness.

This steel should have a case hardening treatment of 8 to 12 hours at 1600° to 1650° F. It should then be cooled to 1550° F and quenched in oil. The draw is usually 400° to 600° F, depending on depth of case desired. The liquid (cyanide) heat treatment is also satisfactory with this steel.

If there are intricate, tricky sections in the mold, treat this steel as follows:

Preheat at 1000° to 1100° F until the piece has been thoroughly soaked, then remove to a cyanide bath at between 1350° to 1400° F; raise temperature gradually to 1550° F and hold at this temperature for not less than two hours, depending on its size, to assure a good cyanide case.

Quench in oil and the Rockwell "C" hardness will be between 59 and 62 and after a 3-hour draw at 650° F the Rockwell "C" hardness will be 55. This insures a good wearing mold, with ample resistance to heavy pressure and strong backing to the slight casing, owing to the refinement of the core.

Next month we will publish the first article of a series on the Design and Construction of Molds by Gordon B. Thayer, Plastics Design Engineer of the General Industries Company.

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New Literature on Speedmaster Variable Speed Pulleys

A NEW four page circular, illustrated and in color, showing a number of shop applications of the Speedmaster Variable Speed Pulleys has been issued by the Speedmaster Company, division of Continental Machines, Inc. With the Speedmaster, the right speed for every job is quickly and accurately set and maintained. Pulley faces of solid black Bakelite of high impact strength and wear resisting qualities are mounted on ground steel bearing tubes. "Oilite" bearings are positively lubricated by patented recirculating oiling system. Pulley assembly is free floating, providing automatic self-aligning of belts at all times.

Two series, each in two sizes, are available. One series, the S-0, is designed for machine manufacturers and shops who wish to incorporate variable speed in their machines, designing their own convenient method for mounting and adjusting the unit. The other series, the S-1, is mounted on standard Speedmaster bracket.

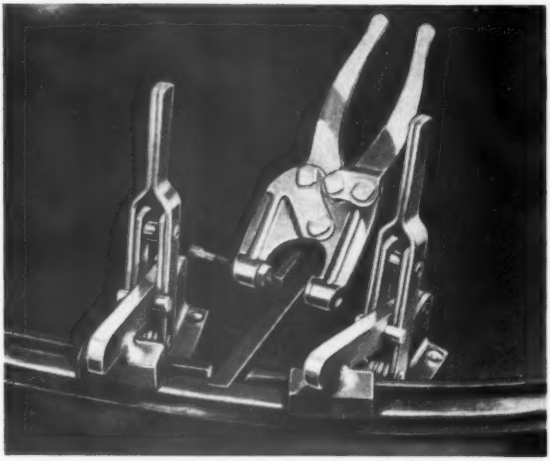
Advantages listed by the manufacturer include: speed range to over 6-1; use of standard "V" belts; compactness; operation at any angle; noiseless, insulated pulley; transmission efficiency up to 90%; and extremely low price. Speedmasters may be purchased on 30-day trial basis.

For your copy of new circular on Speedmaster Variable Speed Pulleys, write the Speedmaster Company, 1482 Miner St., Desplaines, Ill.

Carborundum Transfers Collinson; Promotes Konker

CHARLES KNUPFER, vice president of The Carborundum Company, announces the transfer of H. W. Collinson, who for many years has been District Sales Manager in the Cleveland industrial territory, to the position of District Sales Manager of The Carborundum Company at Chicago, Ill. Mr. Collinson takes over the Chicago post formerly held by F. E. Gridley, who has been granted an extended leave of absence.

To succeed Collinson at Cleveland, announcement is also made of the appointment of E. F. Konker, formerly a member of the Carborundum sales staff, as District Sales Manager.



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New Milling Cutters Have Kennametal-Tipped Blades

McKENNA Metals Co. announces a new series of milling cutters equipped with Kennametal-tipped blades, which have been developed in cooperation with the McCrosky Tool Corp., Meadville, Pa.

The fast machining speeds and high resistance to wear found in Kennametal-tipped single point cutting tools are also characteristic of the new milling cutters. In the job illustrated, the 7" diam. standard McCrosky Jack-Lock Shell End Mill tipped with Kennametal grade KM is milling an S.A.E. 4150 steel forging that was heat-treated before machining to a hardness ranging from 28 to 32 Rockwell C. The cutter is run at 92 R.P.M., or approximately five times as fast as was possible with a cutter equipped with high speed steel blades. The feed is 3⅝" per min. and the depth of cut .125". An average of 160 faces were milled before regrinding was necessary, which was a much longer run than could be made with high speed steel blades.

The new series comprises nine standard sizes in each of the following types of cutters: Medium duty face mills, heavy duty face mills and shell end mills. Incorporated in these milling cutters are exclusive features developed by McCrosky engineers which are particularly advantageous when using blades tipped

(Continued on next Page)

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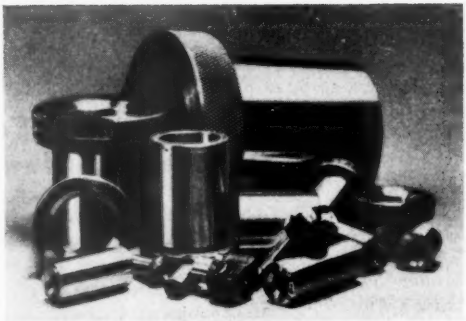

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Dumore Develops Mounted Wheel Shank Support

A MOUNTED wheel shank support for internal grinding with small diameter wheels has just been announced by the Dumore Company. The support was developed especially for grinding small diameter holes to considerable depths. A special 3" wheel shank is necessary for use with the support.

Weak wheel shanks and small wheels formerly would not permit operation at high speeds with a shank 3" long. Small diameter holes had to be "eased" out, a costly method, or not ground at all. However, with the Dumore wheel shank support, the shop man can grind small diameter internal jobs quickly and efficiently. The tapered support slips over the wheel shank, minimizing the possibility of "whip". The support sufficiently strengthens the shank to permit deeper cuts.

The shank is 2 1/8" long and .2204" in diameter at its larger end. There is a 3/8" per foot shank taper.

On one particular job a hole—2 1/2" deep and 1/4" in diameter—was ground in 15 minutes, a fraction of the time required previously for the same work.

For specifications and name of nearest dealer, write the Dumore Co., Dept. 370-A, Racine, Wis.

Wheelock, Lovejoy Opens Cincinnati Warehouse

Wheelock, Lovejoy & Co., Inc., has opened a new warehouse at 4524 W. Mitchell Ave., Winton Place, Cincinnati, O. To the initial stock of the popular Hy-Ten steels, other Hy-Ten grades and S.A.E. Alloys are being added to give the shops in the Cincinnati area better delivery service.

Kennametal-Tipped Blades

(Continued from Page 28)

with the hard carbide material, Kennametal. The Jack-Lock Wedge locks the blade with extreme rigidity and may be locked and unlocked without pounding, thus avoiding damage to the blades. In addition, the special adjusting screw in back of each blade permits fine and accurate forward adjustment that holds to a minimum the amount of expensive carbide material which must be removed to align all blades when regrinding. These design features are shown in the eighteen-blade facing mill illustrated.

Complete information on the new Kennametal-tipped milling cutters will be furnished on requests made to the McKenna Metals Co., 188 Lloyd Ave., Latrobe, Pa.

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The Catalog Review

Brief descriptions of current industrial literature including technical booklets and bulletins, catalogs and circulars. All may be had upon request, without charge or obligation, also see "Buy With Confidence Directory" listings for products or services you require.

BULLETIN RC-4, describing the T-J line of pneumatic remote controls for presses, brakes, shears, indexing mechanisms, special machines and equipment of all types, is ready for distribution. The Tomkins-Johnson Co. machine controls furnish, according to the manufacturer, an effective, flexible and accurate means of instantaneous control of hydraulically operated machines. T-J remote controls are easy to install, eliminate conversion units, provide "selective" saftey control, including a simple "non-repeat" feature. "Main" or power valves and "button" or control valves are shown as also are typical installations on various types of pin and block and friction type friction clutch machines. A copy of Bulletin RC-4 will be sent on request. Address Tomkins-Johnson Company, 630 N. Mechanic St., Jackson, Michigan.

A NEW ACCESSORIES CATALOG, listing and illustrating the complete line of "Super-Speed Cutters, Collet and Table Chucks, Machine Vises, Graduating Machines and Cutter Grinders, has just been issued by the George Gorton Machine Co. Accessories for the Gorton Duplicators and 3-Dimensional Pantographs are also included. An innovation for this company is that prices are shown for all items listed. The George Gorton Machine Co. announces the establishment of an Accessories Department to handle the increasing volume of small tool and accessories sales. The company will send a copy of the new Accessories Catalog to anyone writing them on a business letterhead. Address the George Gorton Machine Co., 1119 13th St., Racine, Wis.

CONTOUR SAWING HANDBOOK (Volume II, 8th Edition) is the most complete Handbook on Contour Band Sawing to be issued by Continental Machines, Inc. The new edition of the Handbook covers approved working techniques for contour machining of "lathe," "milling," "shaper," short run "stampings" and "forgings" types of work. The sections on jigs and fixtures, cams, templates and special parts offer many valuable ideas for saving materials and time. The section on file bands discusses internal, external and production filing. Of considerable interest is the section "50 Examples of Ways to Cut Machining Costs," each case an identified job and shop story illustrated by pictures and drawings and giving working time in each instance. Copies of the new Contour Sawing Handbook may be obtained by writing Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn. Please ask for your copy on your company letterhead.

FCC PRODUCTS AND SERVICES, a 64-page catalog, lists the forgings, composite steel die sections, nitri-cast-iron, tool steel cast to shape and the No. 17 metal resistance grids produced by The Forging and Casting Corporation. The catalog is well indexed, profusely illustrated with numerous applications and instructions for the most efficient use of many FCC products. Die men will find the sections on tool steels cast to shape and composite steel die sections particularly useful. Reference tables, charts and specifications of alloy and cast to shape steels are also included. For a copy of the catalog write to The Forging and Casting Corporation, Ferndale, Michigan.

Reciprocating Hand Tool Speeds Finishing Work

A NEW tool, the HOOVER MULTI-PURPOSE TOOL, with a recipro-

cating movement to be used for taking off the last thousandths in special machine production, in die sinking, tool and plastic mold making is now offered by H & H Research Company. Powered with a 110 volt universal motor, the tool chips, saws, files, burrs, hones, developing a six to sixteen pound push at the end of the file.

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For illustrated circular on Hoover Multi-Purpose Tool write H & H Research Company, 1923 West Buena Vista, Detroit, Michigan.

Firth-Sterling Appoints Rasp and Chivers to Superintendencies

THE Firth-Sterling Steel Company announces two additions to its operating personnel. John H. Rasp, who has had wide experience in the manufacture of specialty tools and dies, has been appointed superintendent of the tool and die department of the company's sintered carbide division. J. H. Chivers has been appointed superintendent of melting to fill the vacancy created by the death of the late L. B. Knox. Mr. Chivers has served several of the leading tool steel companies as a consultant on melting practice.

Bates Announces Two New Inspectors' Hammers

Two new types of Marking Hammers for inspectors' use are announced by H. O. Bates of Elizabeth, N. J. Style B Hammer, shown as the upper hammer, is furnished with one or more characters or symbols engraved on one or both faces. If one end only is engraved, the plain end can be used for inspection tapping to locate defective spots in material. When a trade-mark is used the inspector's number can be engraved within the design as shown. Style C, the lower hammer, carrying only one letter, symbol or number, is lighter in weight.

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(Continued on next Page)

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Bates Inspectors' Hammers

(Continued from Page 31)

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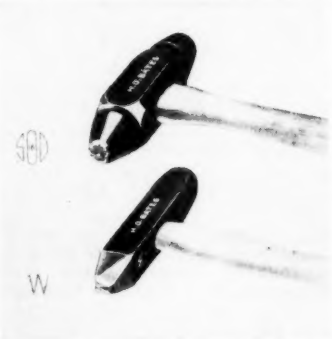

long service even when used on unhardened alloy steel parts, castings, stainless steel, aluminum and other materials. Blank heads are carried in stock to facilitate shipment of orders.

Literature and prices on Styles B and C Hammers is available for shop distribution. Write H. O. Bates, 251-257 N. Broad Street, Elizabeth, N. J.

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● **This directory of products lists for ready reference the names of manufacturers and dealers whose sales to Tool·Die·Machine PROGRESS readers have established them as dependable in every sense of the word. They merit your consideration.**

● **Complete information about any product may be had upon request made to the firm listed or to us.**

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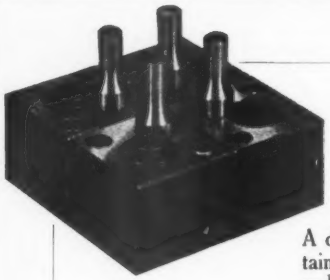

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Darwin & Milner, Inc., 1260-1264 West 4th St., Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.
STEEL PLATE—Ground
Die Supply Co., 2059 Hamilton Ave., Cleveland, Ohio.

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Baker Contour Grinder meets today's demand for production of better dies at lower cost because (1) Table is fully accessible and size of work is not limited by obstructions. (2) Without change, the machine handles internal or external grinding. (3) Complete visibility allows operator to follow template or scribed line. (4) Easily controlled vertical reciprocation increases life of wheel and increases cutting efficiency.

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The Walton Co., 88 Allyn St., Hartford, Conn.

TAPPER—Precision
The Master Tapper Co., 2 Main St., Belleville, N. J.

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Eclipse Counterbore Co., 7428 St. Aubin Ave., Detroit, Mich.

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Gerstner Tool Chests, 56 Columbia St., Dayton, Ohio.

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Star Tool & Die Works, 2522 24th St., Detroit, Mich.

WELDING PLIERS
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Advice from a competent Tool Steel man helps many manufacturers cut costs.

A periodic check-up is worth-while, especially where the supplier does not regularly provide this service.

It pays to use Good Tool steel.

COLUMBIA TOOL STEEL COMPANY
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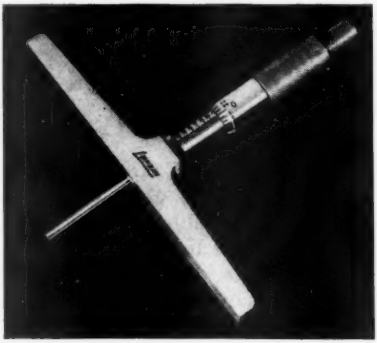

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When you order or write about products described in TDM PROGRESS please mention the publication.

Replaces Wood, Metal and Rubber Hammers

THERE are innumerable instances in the building of dies, jigs, fixtures, tools and machines when forceful blows are required. It may be in fitting or assembling or when adjustments are necessary, or again it may be in loosening parts because of the necessity for dismantling. Regardless of the need, such blows must be struck forcefully without breaking, injuring, or even marring the surface.

Rawhide hammers and mallets are particularly valuable for such use. They are non-metallic and their tightly rolled resilient rawhide eliminates chipping or shearing which so frequently endangers workers' eyes or even results in chips or pieces dropping into machine or product.

Rawhide hammers will not spark against any metal surface so they may be used safely in chemical and other plants where the fire hazard must be particularly considered. These Rawhide hammers are always ready for use because when the faces become worn they are easily replaced.

The Chicago Rawhide Manufacturing Company catalog describes, illustrates and lists not only these Rawhide mallets, hammers and mauls, but also a complete line of other mechanical leather products for industrial use including belting, packings, gears and pinions, protective boots, aprons, hand leathers, couplings, polishing wheels, valve discs, washers, gaskets and oil seals.

This valuable descriptive catalog is available on request to the Chicago Rawhide Mfg. Co., 1280 Elston Ave., Chicago, Ill.

Linderme Introduces Two Spindle Adjustable Drill Head

THE Linderme Machine & Tool Co. of Detroit, Michigan, announce a newly patented, two spindle, quick-set, adjustable drill head. Adjustment to desired drill centers (⅞" to 6") may be made by the simple turning of two hex nuts, and when tightened will not shift or slip. Recommended drill sizes 0 to ½". Especially suitable for small drill presses, such as light type Canedy Otto and Demco No. 15, also adaptable to larger presses. Used for tapping operations.

Literature giving detailed specifications will be sent on request. Address the Linderme Machine & Tool Co., Inc., 12251 Coyle Ave., Detroit, Mich.

Oliver Designs New Tool and Cutter Grinder; Introduces Many Desirable Improvements

A NEW design of Tool and Cutter Grinder, using the principle of the older type but embodying many desirable improvements, has been announced by the Oliver Instrument Company.

The principle of grinding on the new Tool and Cutter Grinder is reversed from the usual type in that the work is held stationary and the grinding wheel traverses the cutting edge of the cutter. The grinding wheel is carried on the forward end of the ram which slides in a fixed bearing at the upper end of the pedestal. The wheel has a stroke of 10" and has a bearing 15" in length. It is traversed by means of a rack and gear which in turn is actuated by a lever adjustable to the position of the operator. The motor is carried on the rear end of the ram and is belted to the grinding spindle.

Fig. 1 shows the machine with centers in place and Fig. 2 shows the adjustable Timken Bearing Head with taper for mounting the various types of cutters for which it is adapted.

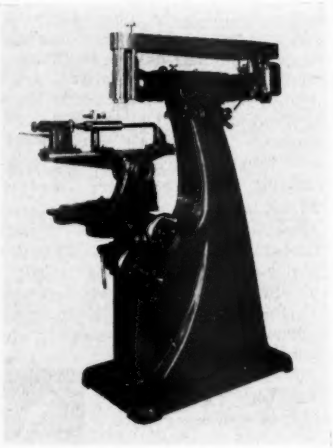
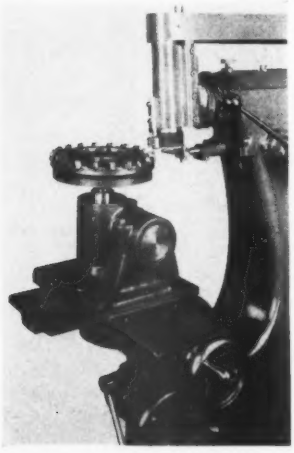


Fig. 1

Fig. 2



The advantage of this method of grinding cutters is that the operator stands in a natural and convenient position, the work is directly in the line of sight, it is easier to guide the cutter against the lip rest and the ram and bearing is above the flow of emery and dirt, as are also the operator's eyes.

The new unit grinds all types of milling cutters and reamers with a minimum number of attachments. This means less time in adapting the machine to various types of cutters.

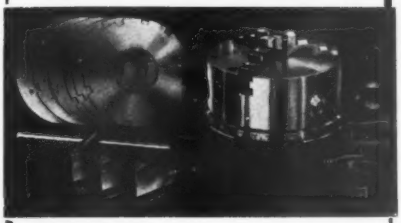
Face mills up to 14" in diameter can be ground on face and periphery at one setting of the cutter in the anti-friction bearing and many odd types, such as dovetail cutters, are easily ground with the same fixture.

The Oliver Cutter Grinder can be supplied with or without fixtures. It is equally adaptable for general service in the average tool room and die shop or for single operation grinding for large grinding rooms.

Special fixtures have been developed for grinding round corners on end mills, for small end mills, for broach grinding, tap grinding, point thinning and other operations.

For complete information on the new Tool and Cutter Grinder, write the Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.

Eliminate Errors—



The Hartford "Super-Spacer" provides rapid, accurate indexing — its simplicity and fool-proof design eliminates indexing errors even by less experienced operators. "Super-Spacer" is equally adaptable for special work or for production.

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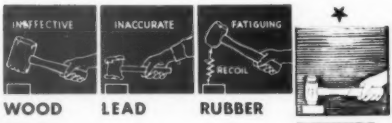

WOOD LEAD RUBBER RAWHIDE

WOOD
makes a clumsy tool that will split and crack.

METAL
has edges that turn, break and fly off.

RUBBER
makes a bouncing head that chips and smears.

RAWHIDE
heads and faces stay accurate, absorb shock and wear longest.

• Chicago Rawhide Hammers and Mallets are the tools for striking hard accurate blows safely on any surface that must not be cracked, battered or marred. The tough Java Water Buffalo hide, coiled, compressed and treated for long life will not split, break or even dent, and has resilience to absorb rebound for easier, accurate blows

• This hammer and mallet with genuine rawhide heads are quality tools for thrifty mechanics. Sold by industrial supply houses everywhere.

CHICAGO Rawhide MFG. CO.
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CIRCULAR TABLES

10 inch, 12 inch, and 15 inch diameter; substantially constructed to provide years of high precision service. Write for Gorton Accessories Catalog and learn more about these *extra-value* tables.

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DON'T BUILD THAT ADDITION . .

Perhaps you really don't need that extra manufacturing space. Perhaps by reorganizing your present facilities you can effect efficiencies that will solve your problem.

By making changes in manufacturing methods, we have successfully enabled plants to relieve the pressing conditions. Thus, through our engineering help, the necessity of acquiring additional equipment or the building of new manufacturing space was obviated.

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Among these shops will be found modern facilities for building every kind of Special Tool, Die and Machine. Some are equipped for small and medium size work, others for large. Some do Designing and Engineering, Development and Experimental Work and build Models; others are equipped for production of Precision Specialties of every description. Still others operate Machine Production plants and manufacture Parts, Stampings and Complete Assemblies. All will appreciate the opportunity to submit estimates.

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The Hamilton Portable Elevating Table

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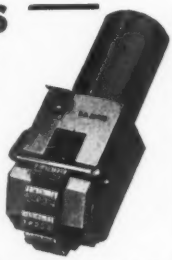

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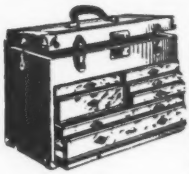

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Used by fine mechanics everywhere.
Send for Illustrated Catalog
GERSTNER TOOL CHESTS
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(Continued from Page 43)

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Economical Machine Work Done.
Let us quote on producing machine parts for you. We are equipped to do GENERAL MACHINE WORK *of all types.*

Diamond Wheel Dresser is New Stanley Contour Grinder Accessory

A FIXTURE, the No. 155 Diamond Wheel Dresser, is now available for use with the Stanley Contour Grinder. This fixture provides an inexpensive means of truing and dressing grinding wheels or points. A ring on the bottom of the Dresser fits in counterbored hole on table top of the Grinder. A large knurled adjusting screw is provided for setting Dresser. Holder in which diamond (¼ to ⅛ carat) is mounted is adjustable. A small knurled screw is provided for accurate setting of diamond and to regulate depth of cut.

The Stanley Contour Grinder is used by tool and die makers for finishing dies, gauges, templets and special shapes. Its motor is held in a holder which can be adjusted from 90° to 45°. Mounted point, wheel or rotary file project through the table.

Whether you write the Stanley Electric Tool Division, New Britain, Conn., or call your equipment dealer, mention you saw this Diamond Wheel Dresser story in TDM PROGRESS.

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Substantially reduces labor costs by eliminating the expensive procedure of drilling from the solid.
BISCO TOOL STEEL TUBING is a fine grade tool steel in tubular form available in sizes up to 14" diameter and 2" wall thickness; other sizes to your specification.
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DRILL JIG
COLONIAL
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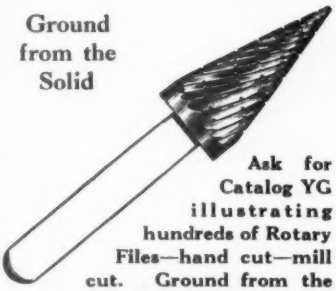
GROBET
ROTARY FILES

Ground from the Solid



Ask for Catalog YG illustrating hundreds of Rotary Files—hand cut—mill cut. Ground from the solid. Ask also for our Catalog YF illustrating more than 5000 different shapes, sizes and cuts of Grobet Precision Files, also files for all types of filing machines.

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Guaranteed Quality at Prices that Save you Money

We are now located in our new, larger quarters and are in a position to give better service than ever. If you are in a hurry, try our service.

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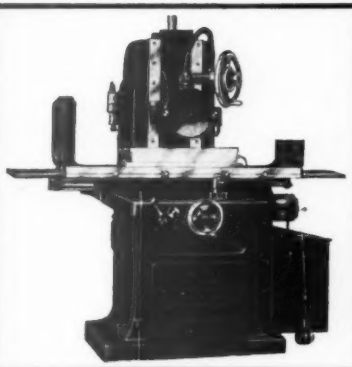

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Combine Speed and Precision
Sizes from 6"x10"x18" to 30"x25"x144"
Get Bulletin GL-100 Now
GALLMEYER & LIVINGSTON CO.
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One Man and a *"Portelvator"*

No shop is completely equipped without it.

Lift and move 2000 to 5000 pound dies, jigs and fixtures easily and safely. This **Hamilton Portable Table** quickly overcomes its cost by eliminating costly mishaps and breakage and in actual time saved.

Write for circular and prices

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Reprints of Practical Points in Die Construction

Published in January issue aroused widespread interest due to practical value to die designers and builders.

Are now available for general shop or school use. One Cleveland shop owner in ordering 50 copies said: *"I want every man in the shop to have a copy. They will save me money."*

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We use the best materials and accessories we can buy. We machine all parts accurately, harden and grind them to fit perfectly.

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We analyze the requirements carefully and develop the device to function efficiently and economically.

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MARVEL SAWS

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No. 18 Hydraulic

The MARVEL No. 18 is enormously heavy and sturdy with all working parts fully enclosed. It has fewer moving parts, will stand a lot of battering, the grind of continuous operation, still is an exceptionally efficient, fast, and economical saw in operation, for it introduces two new principles—(1) The "Ball Bronze" blade action that affords progressive contact of the blade teeth throughout the cutting stroke; and, (2) Simplified low pressure, feed-proof and trouble-free Hydraulic feed and quick traverse.

The MARVEL System of Metal Sawing provides an efficient sawing machine for every purpose, and non-breakable High-Speed Edge Hack Saw Blades for every Sawing Machine.

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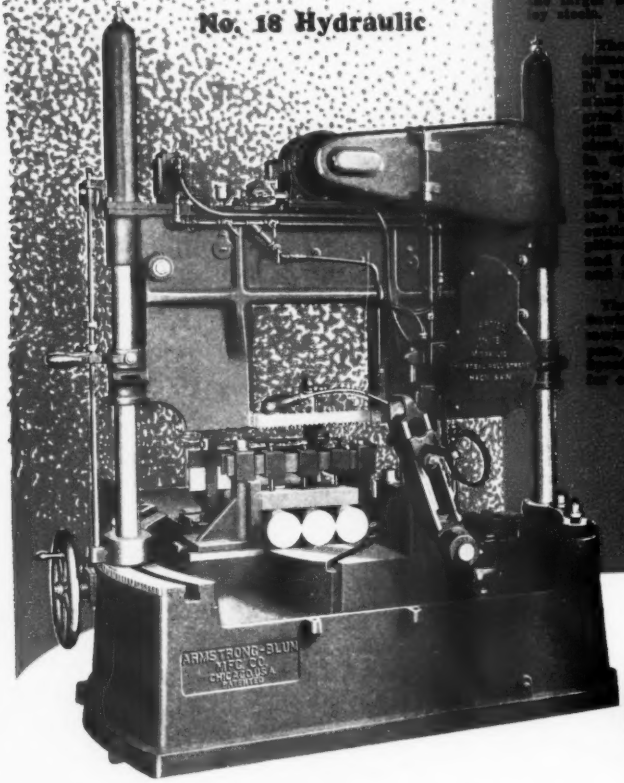

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